Delta Simulation Model 2

improvements/extension for sediment & mercury

DSM2 User Group May 14th, 2014

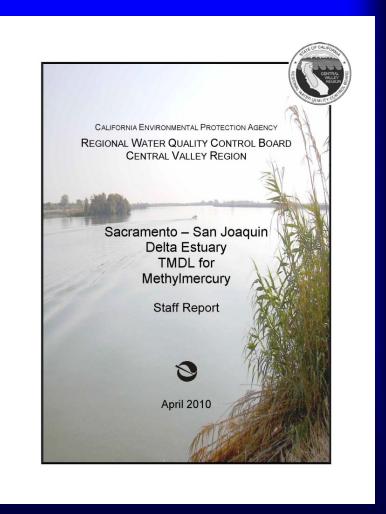
Jamie Anderson, Ph.D., P.E.
Nicky Sandhu, P.E., En-Ching Hsu, Ph.D., P.E.
Hari Rajbhandari, Ph.D., P.E.
Carol DiGiorgio and Tara Smith, P.E.
Reed Harris, M.Eng, P. Eng.



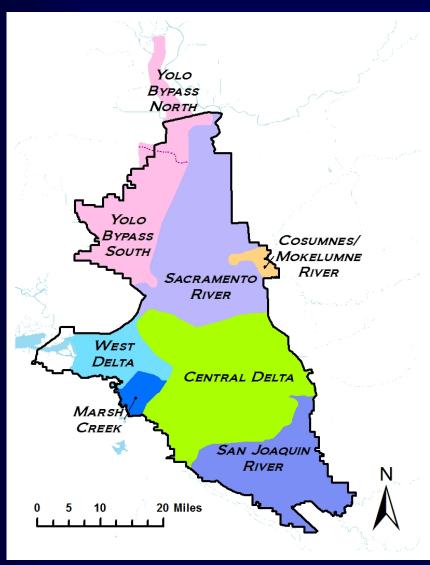


Delta Mercury Total Maximum Daily Load (TMDL)

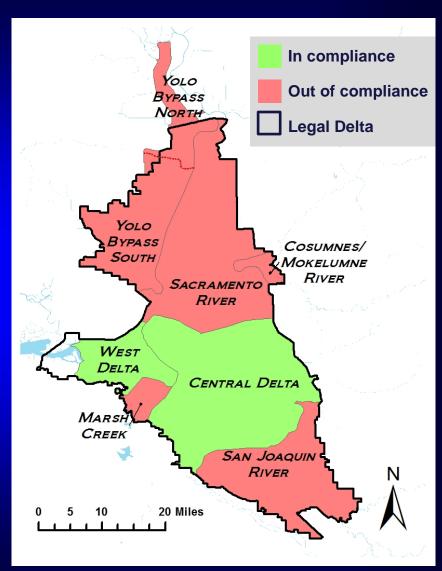
- 1990 Sacramento-SJ Delta listed as impaired for fish consumption due to mercury [Clean Water Act 303 (d) list]
- **2010** Regional Water Quality Control Board adopted amendments to the Sacramento River and San Joaquin River Basin Plan to establish the Delta Mercury Control Program which establish Total Maximum Daily Loads (TMDL) for mercury in the Delta
- 2011 US EPA approved the TMDL and DWR is required to comply with the TMDL



What areas are affected by the TMDL?

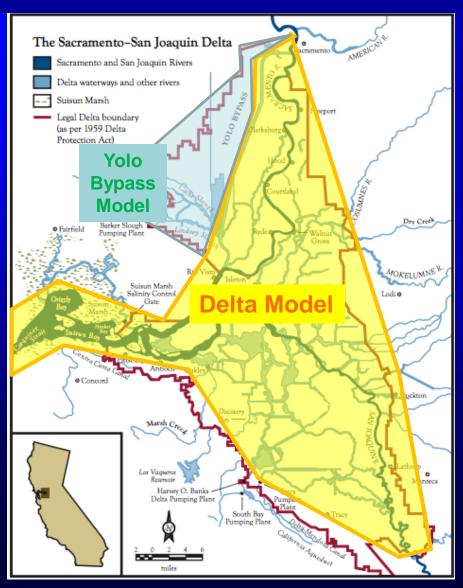


What areas require load reductions?



Modeling Objectives to Support Hg TMDL

- Two models are being developed
 - Yolo Bypass
 - Delta Open Waters
- Goal: assess impacts of current & proposed operational changes on mercury methylation potential
 - Water management
 - Flood conveyance



Modeling Approach

Conceptual Models Understand processes

Numerical Model Development

Identify key processes
Prioritize key processes
Represent processes in DSM2

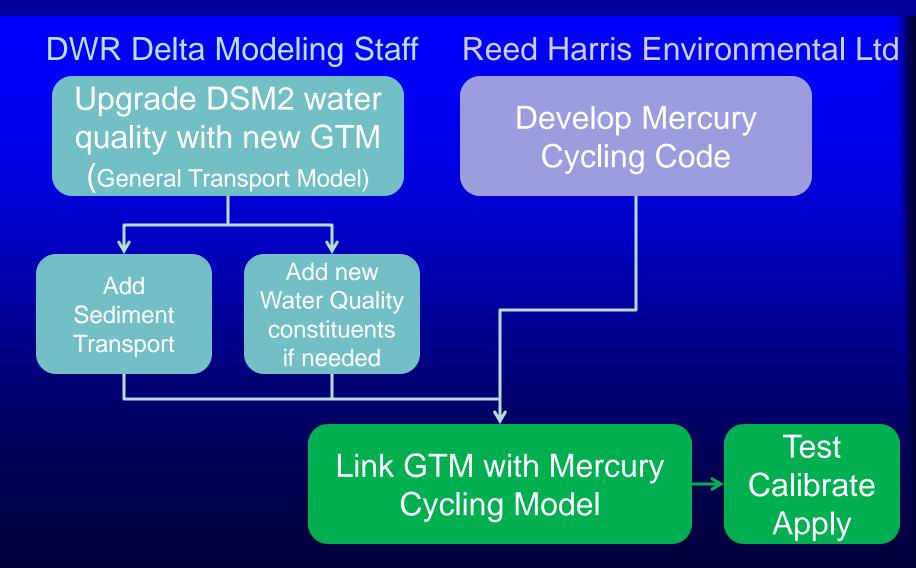
Simulate Existing Conditions

Obtain available field data
Identify data gaps
Calibration/validation
Sensitivity testing

Scenario Testing

How would changes in operations affect mercury methylation potential?

Extending DSM2 for Sediment & Mercury



Previously planned Sediment Transport Model may not cover all important processes for mercury

Add Organics

Sediment Transport

- Advection (go with flow)
- Reaction
 - -None for sands
 - -Flocculation for clays
- Dispersion (mixing)
- Settling
- Resuspension
- Bed load

Mercury Model

- Transport
 - -Sorbed to sediment
 - -dissolved in water
- Reaction
 - -Mercury cycle including methylation
- Dispersion (mixing)

Bed Representation

Sorption

Desorption

- Deposition/scour
- Anoxic conditions
- MeHg production
- Release of MeHg to water column

Initial Model Development: focus on Water Column

Well mixed suspended Flow (cfs) sediment concentration for Tributary concentrations(mg/l) **Concentrations Channel Geometry** every 15 min • Fines (silt/clay & organics) **Dispersion & rate coefficients** Additional parameters for Hg binds to fines erosion/deposition (TBD) Sand Hg does not bind to sand Assume no bed load Water Column J Bed (sediment compartment) Bed interactions represented as boundary fluxes estimated from data/literature

DSM2 Sediment and Mercury Model Status

Where we are now



Research & code development

Where we are going



Model Integration



Calibration/Validation

